

# **Combined Heat and Power (Cogeneration)**

## **ENERGY STAR® Award and CHP Certificate of Recognition**

The United States Environmental Protection Agency (EPA) and the United States Department of Energy (DOE) recognize highly efficient CHP projects that achieve fuel savings over comparable state-of-the-art separate heat and power. Projects can receive an EPA ENERGY STAR® CHP Award or an EPA CHP Certificate of Recognition.

The **ENERGY STAR® CHP Award** recognizes projects using at least 5% less fuel than separate heat-and-power generation. To apply, projects must have a minimum of 12 months and 5,000 hours of operating data that begins no more than 18 months prior to the date of the application. The majority, 7 months minimum, of the operating data will determine the recognition year the application. Thermal energy must comprise between 20% to 90% of total net system output. In addition, projects must be operating within their emission permit levels. Any existing CHP project, or any modified project, including previous winners, can be evaluated for an award.

The **CHP Certificate of Recognition** recognizes efficient CHP projects that demonstrate leadership in environmental performance without achieving the strict award criteria. To apply, projects must be in operating within emissions permit levels but do not require the full 12 month and 5,000 hours of operating data. Projects that demonstrate emerging technologies, fuel diversity, or otherwise advance new markets for environmentally beneficial CHP are candidates for the certificate.

### **Required Application Information**

1. Facility name and address
2. Contact name and information
3. Total gross and net project efficiency (with supporting operating data)
4. Other environmentally beneficial characteristics
5. Signature of responsible official

### **Process**

There is no firm deadline for submitting applications. We accept and process applications continuously and present awards at key events, such as our annual CHP Partners meeting, the EPA ENERGY STAR® Awards ceremony, or other Partner events. For specific events, we will post a deadline for submittal of applications so that we can evaluate applications and prepare for the event. EPA/DOE reviews all applications.

### **Recognition**

A plaque will be presented to Award or Certificate winners recognizing the project's energy and environmental excellence. Recognition may also include highlighting winners on EPA and DOE web sites, in press releases, and in case study materials. Awards will be presented at events agreed upon by both the winners and EPA/DOE.

## Example Award Efficiency Criteria Assessment

For purposes of the ENERGY STAR CHP Award evaluation process, CHP project efficiency will be compared to highly efficient separate heat-and-power generation (e.g. an onsite boiler and grid electricity). A challenging comparison (for natural gas fueled systems) assumes a 50% efficient natural gas combined cycle electric-only plant (average electric generation efficiency in the United States is 33%) and an 80% efficient steam boiler. To be eligible for consideration, the CHP project must use at least 5% less fuel at the same power-to-heat (P/H) ratio.

Assume, for example, a 100 MW and 1,000,000 lb. steam/hr CHP system.

First, convert to consistent units:

$$\frac{1,000,000 \text{ lb steam}}{\text{hr}} * \frac{(1,200 \text{ btu} - 50 \text{ btu})}{\text{lb steam}} * \frac{1 \text{ MWh}}{3,412,000 \text{ Btu}} = 337 \text{ MW}$$

The energy content of thermal output will vary, but in all situations, the energy content of the makeup water should be subtracted. The energy in condensate return will be considered 100 Btu/lb unless actual measured data is available.

Calculate separate heat and power efficiency ( $E_{\text{SHP}}$ ) from the assumed electric generation efficiency ( $E_{\text{P}}$ ) and the assumed thermal generation efficiency ( $E_{\text{TH}}$ ):

$$E_{\text{SHP}} = \frac{\frac{1}{\frac{\% \text{Power}}{E_{\text{P}}} + \frac{\% \text{Thermal}}{E_{\text{TH}}}}}{1} = \frac{1}{\frac{100/(100 + 337)}{0.5} + \frac{337/(100 + 337)}{0.8}} = 70.3\%$$

Calculate award efficiency ( $E_{\text{Award}}$ ):

$$E_{\text{Award}} = \frac{E_{\text{SHP}}}{(1 - \% \text{Less Fuel})} = \frac{70.3\%}{(1 - 0.05)} = 74\%$$

For projects with a P/H ratio (power output divided by thermal output) of 0.3 the minimum efficiency to be eligible for an ENERGY STAR CHP Award is 74%. Award eligibility efficiency varies with power-to-heat ratio. The following table shows the minimum award eligibility efficiency (HHV) at different power-to-heat ratios.

P/H Ratio	Separate Heat & Power Efficiency	Award Eligibility Efficiency (5% Less Fuel)
0.11	75%	79%
0.40	68%	72%
1.00	62%	65%
4.00	54%	57%

Different efficiency requirements will apply for projects using fuels other than natural gas. Coal and oil comparisons are 83% efficient thermal and 37% and 45% efficient electric generation respectively. The pulp and paper biomass comparison is 75% efficient thermal and 34% efficient electric generation. For natural gas, coal, oil, and pulp and paper biomass projects less than 100 MW<sub>e</sub> the electric efficiency comparison will be 48%, 35%, 43%, and 33% respectively. Projects using other fuels or with other than steam recovery will be compared to the appropriate technology.

## Additional Information/Application Materials

Luis Troche  
US EPA CHP Partnership  
Ph: (202) 343-9442  
troche.luis@epa.gov  
www.epa.gov/chp

# ENERGY STAR<sup>®</sup> CHP Award and Certificate of Recognition Application

All applicants must fill out the information in the space provided.  
Supporting documentation with measured operating data is required.



## General Information

Company/Organization: \_\_\_\_\_

Facility name: \_\_\_\_\_

Facility address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Project startup date: \_\_\_\_\_

Contact name: \_\_\_\_\_

Contact title: \_\_\_\_\_

Contact address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Contact phone: (     ) \_\_\_\_\_

Contact fax: (     ) \_\_\_\_\_

Contact E-mail: \_\_\_\_\_

## Technology Information

	Design Capacity	Single Year Operating Data <sup>1</sup>
Net power capacity	kW	kWh
Net thermal capacity	MMBtu/h	MMBtu
Heat input (HHV)	MMBtu/h	MMBtu
Total net efficiency (%)		

Annual operating hours: \_\_\_\_\_

% Electricity sold to grid: \_\_\_\_\_

<sup>1</sup> Supporting documentation of net operating efficiency and calculation method is required. This includes a monthly or quarterly summary of total fuel input, gross energy output, and parasitic losses (gas compressor, fans, etc; do not include energy for distributing thermal output). Any twelve months of consecutive operating data is acceptable (must include all data, not just best 5,000 hours) beginning January to June of the calendar year preceding the application. (The majority, 7 months minimum, of the operating data must be from the calendar year preceding the application.) If, for competitive reasons, detailed operating data is not available enough information should be provided for reviewers to clearly understand how the efficiency calculation was performed.



## Technology Information (continued)

While not required, emissions will be evaluated on an output basis and enhance applications.

	Emissions	Data Source
Permitted/estimated NO <sub>x</sub>		
Permitted/estimated CO		
Permitted/estimated SO <sub>2</sub>		
Permitted/estimated PM		

Check prime movers and list number and size in description:

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> Gas (combustion) Turbine | <input type="checkbox"/> Combined Cycle | <input type="checkbox"/> Steam Turbine |
| <input type="checkbox"/> Fuel Cell                | <input type="checkbox"/> IC Engine      | <input type="checkbox"/> Other         |

Check fuels used and list percentages in description:

- |                                      |                               |                                       |
|--------------------------------------|-------------------------------|---------------------------------------|
| <input type="checkbox"/> Natural Gas | <input type="checkbox"/> Coal | <input type="checkbox"/> Landfill Gas |
| <input type="checkbox"/> Biomass     | <input type="checkbox"/> Oil  | <input type="checkbox"/> Other        |

Check thermal output uses and describe below:

- |  |   |  |
|--|---|--|
| <input type="checkbox"/> Process Steam | <input type="checkbox"/> District Heating | <input type="checkbox"/> Space Heating |
| <input type="checkbox"/> Space Cooling | <input type="checkbox"/> Other            |  |

Description of project including thermal (with temperature) and electric (or mechanical) energy applications and why the project was an attractive investment:

---

---

---

---

---

---

---

---

---

---



## Innovative Applications and Environmental Benefits

EPA and DOE encourage innovative applications or other CHP projects that offer significant environmental benefits. Examples include direct-mechanical drives, direct heating, and emerging technologies. Use the space below to explain any innovative aspects or additional environmental benefits associated with your project.

---

---

---

---

---

---

---

---

---

---

---

---



If you are interested in learning more about how EPA's CHP Partnership can assist you with CHP projects, contact Luis Troche or visit [www.epa.gov/chp](http://www.epa.gov/chp).

ENERGY STAR Award winners: Your signature below indicates consent to associate EPA, DOE, and the ENERGY STAR name and logo only with ENERGY STAR CHP Award winning project(s) and to adhere to EPA's Logo Usage Guidelines.

Signature/Title of responsible official: \_\_\_\_\_ Date: \_\_\_\_\_

Please send completed application to:

Luis Troche  
Ph: (202) 343-9442  
Fax: (202) 343-2208  
[troche.luis@epa.gov](mailto:troche.luis@epa.gov)

*Mailing Address:*  
US EPA (6202J)  
1200 Pennsylvania Ave., NW  
Washington, DC 20460

*Office Address and Express Delivery:*  
US EPA (6202J)  
1310 L St., NW  
Washington, DC 20005